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S-E-C-R-E-T

REPORT

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REQUIREMENT NO. RD

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REFERENCES

DATE ACQUIRED

This is UNEVALUATED Information

SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

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Comments:

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2. The following Soviet names throughout the report should be corrected as follows:

Blochintsev - Blokhinstsev,
Feinberg - Feynberg,
Gurevitch - Gurevich,
Leipunski - Leypunskiy,
Mingat Schaur - Mingechaur (N 40-45, E 47-03), and
Savenjagin - Zavenyagin.

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STATE	X	ARMY	#X	NAVY	X	A.	#X	FBI	AEC										
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(Note: Washington distribution indicated by "X", Field distribution by "#".)

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[REDACTED]

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[REDACTED]

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The brief account of the work in the POSE Institute, together with [REDACTED]

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[REDACTED] Russian personalities and activities there throw rather more light on the purpose of the POSE Institute [REDACTED]

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[REDACTED] the Institute was primarily concerned with questions arising from reactor theory and possibly to some extent even design. It is considered to be of some interest, in view of the nature of the tasks, that here in accordance with the usual 1037.P and "DRAGON" pattern the Germans found themselves as usual working on somewhat parallel lines to Russians engaged on similar if rather more comprehensive work.

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[REDACTED]

2. As a sidelight on the work of the Institute [REDACTED]

paragraph in GLASSSTONE's "Source Book on Atomic Energy" p. 382, 14.4, [REDACTED] is extracted for convenience:

a

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"Para. 14.4

"By the middle of 1941 sufficient information had been accumulated as to make desirable experimental measurements with a small uranium-carbon lattice estimated to be from one-fifth to one-quarter of the critical size. It was realized that such a system would not be chain reacting but by means of calculations based on diffusion theory it would be possible to ascertain the multiplication factor for an infinite lattice of the same type. Incidentally, it appeared from these calculations that if the system were about two or three times the critical size the proportion of neutrons lost would be relatively small and the multiplication factor would differ little from that for the ideal infinite

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[REDACTED]

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system to which equation 14.1 is applicable. Consequently, it became the practice to convert the observed multiplication factors to the ideal or limiting values based on the assumption that no neutrons escape from the system since it was known that this condition could be closely approximated by a lattice of finite size.

(Eq. 14.1)

$$k = \frac{\eta \epsilon p f \eta}{\eta} = \epsilon p f \eta$$

η = average number of fast neutrons produced by fission for each thermal neutron absorbed by the uranium.

$\eta \epsilon p f \eta$ is the number of fast neutrons produced as a result of the admission of the η original neutrons to the system.

k is the multiplication factor."

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PART II - REPORT

1.

MINGAT SCHAUR, a little place on the River KURA, Here the Russians were building a hydro-electric station and were carrying out excavations for a railway embankment. There were thousands of PW working in this area, quartered in three camps, perhaps ten thousand men in all. They were cutting canals, driving shafts into the hillsides, etc.

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2.

at OBNINSKOYE, Professor Heinz ROSE, was working in the field of nuclear physics with which his Institute was concerned, and that he had had much trouble operating because of shortages of water and power. He did not like the 1500 Kw. generator with which they were equipped since this was always breaking down.

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3. SCHEFFERS then explained what they were doing and indicated that they were working on reactor theory and calculations.

4. Generally speaking, the nature of these problems was as follows:

- (i) The life history of a neutron in a reactor, i.e. theory of thermal neutrons (probability of origination of neutrons by the fission of the uranium₂₃₅ nucleus with resonance absorption

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- (ii) The mathematical working out on behalf of a colleague, Professor GUREVITCH, of nuclear cross sections.
(GUREVITCH was not located in the Institute).

All the above calculations and desired data led to the calculation of the critical dimensions of a pile and the derivation of a theoretical multiplication factor "k" (Vermehrungs Koeffizient). They were working on the theoretical assumption that the pile was infinite in size and provided that they were able to introduce a given coefficient "k" into their calculations they were able thus to determine working dimensions.

5. They were concerned ultimately with the determination of a pile of smallest possible dimensions pertaining to a given "k".

6. The types of reactors being studied, and there were several, were inhomogeneous having uranium rods and the moderator was either beryllium or later beryllia.

7. The dimensions of the uranium rods were about 2 metres in length and 0.5 - 1 cm. in diameter.

8. These designs or "models" under investigation were considered both at low temperature (i.e. room temperature) and then later at 800°K. This last was probably intended for power plant.

9. In the summer of 1949 BURGHARDT, BLOCHINTSEV, and his three Russian assistants were said to be working on 'breeder' reactor theory, there were about a hundred different variants or alternative designs under discussion for a low temperature reactor. The variables centred round:

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- (i) Different purities of beryllium metal.
- (ii) Different absorption cross sections of beryllium metal.
- (iii) Different enrichment figures of U_{235} in the rods. 10, 20 and up to 30%.
- (iv) At first they worked with uranium plates and then cylindrical rods and beryllium metal with and without beryllium and graphite 'manteln'.
- (v) Then uranium rods were tried with beryllium oxide at room temperature and later at 800°K.

10.

a Russian report written by I. POMERANTSCHUK on diffusion lengths (Diffusionslänge) in a graphite moderated reactor or reactor model containing 500 tons of graphite. The mode of expression of this report, together with the arrangement of data tabulated within it suggested that an actual reactor model containing 500 tons of graphite had been constructed on the full scale. It did not seem to be a complete operating reactor because there seemed to be no uranium in the system.

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14. From the ascertained density of thermal neutrons [redacted] were able to determine the diffusion lengths for thermal neutrons by the formula -

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$$L^2 = \frac{\lambda_s \lambda_c}{3}$$

Mean free paths $\left\{ \begin{array}{l} \lambda_s = \text{scattering} \\ \lambda_c = \text{capture} \end{array} \right.$

15. The "preparat" which did not have much of an intensity was brought from the P.T.R. There was also supposed to be some German uranium metal which POSE had brought [redacted]. Among other material brought from Germany were a large number of research reports on the reactor problem as studied in Germany. This embodied war-time work by HEISENBERG, FLUEGGE and others on work done at the P.T.R. or at K.W.I. It appeared to be a pretty complete range, but these reports were hardly used and the Russians appeared to have not the slightest interest in it.

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16. The work which POSE and his staff did on cross sections was only of such a nature that it was based on proposals put up by themselves on the basis of studies of available literature. The Russians never gave any assignments or offered any suggestions other than those which were based on data or descriptive matter such as could be developed from published literature.

17. On the other hand [redacted] the work put through by the Russian section next to SCHEFFER's laboratory was conceived on the basis of liaison with other institutes which was carried out through BLOCHINTSEV. This was shown by comments made by BLOCHINTSEV when he discussed results obtained by Germans with whom he came in contact, who believed that he had dealings with another institute in MOSCOW which occupied itself with similar problems.

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18. Another personality who created a similar impression was LEIFUNSKI when he produced some data which he had evidently acquired himself while working at some other institute in MOSCOW.

19. [redacted] KRASSIN who was somewhat interested in absorption cross sections of beryllium metal. The calculation of these was not carried out directly by physical and chemical measurement but by indirect means, i.e. measurement of diffusion lengths

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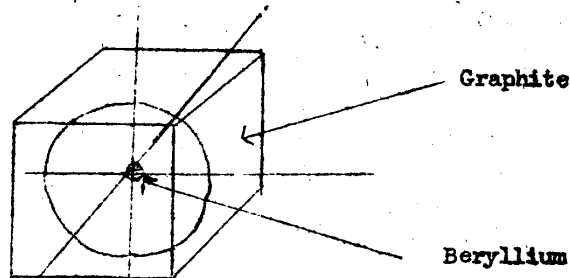
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- 6 -

using the formula -

$$L = \frac{\lambda_s \lambda_c}{3}$$

The problem centred itself around the characteristics of a sphere of beryllium embedded in graphite subjected to neutron bombardment.



The proposal came up in July, 1950 after KRASSIN had measured absorption cross section by the above-mentioned roundabout diffusion methods, to try more direct measurement. This was furthered by BLOCHINTSEV

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another problem with which WESTMAYER was concerned might be stated as follows:-

"When one has a neutron source the neutrons come away with differing velocities. Under such conditions a neutron spectrum could be photographed by means of a photographic plate. By an extensive study of such spectrum it was possible to detect traces of reactions in which 'collision' protons had been participating."

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In connection with the above the experiments which had previously been carried out with a beryllium packing in a cadmium cylinder for diffusion length (see Annexure "A") was to be repeated with a beryllium oxide packing and uranium rods. At least one ton of BeO was necessary to carry out practicable or successful experiments. The dimensions were given by further calculation and the rods and the dimensions of the rods were established at nearly a centimetre in diameter and approximately 2 metres in length. Such rods being spaced at 8 - 10 cm. apart.

The diffusion length in beryllium oxide BeO was determined by calculation as a means to obtaining the multiplication factor. Three variables were in these calculations:-

- (i) Diffusion length (Diffusion länge)
- (ii) Retardation lengths (Bremselänge)
- (iii) Multiplication factor, to be determined by experiment.

(All this was based on neutron diffusion theory).

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PART III - INDEX OF PERSONALITIES

(a) German

Professor FOSE

Worked without German assistance. Co-operated with KRASSIN and BLOCHINTSEV. Concerned generally with diffusion length cross section problems and reaction kinetics studies. Had as a secretary, Christian JOACHIM.

25X1

Dr. WEISS

Worked on radio-activity problems.

WADEWITZ

Assistant to WEISS.

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Dr. SCHEFFERS

Originally from P.T.R. A physicist. He was in OBNINSKOYE the leader of the theoretical physics group

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Ing. SCHMIDT

Operated an electrical laboratory and when he made electric counting equipment he had one Russian colleague, name unknown, and a German assistant. [redacted]

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KRUEGER

Came from SUKHUMI and worked with spectrographic examination of impurities in beryllium and in the inspection of actual quantities of beryllium (place of origin unknown). [redacted]

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Dr. HERRMANN

[redacted] Worked with a B Ray spectrograph. Had a Russian colleague (name unknown).

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Dr. CZULIUS

Worked on general diffusion. [redacted]

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Dr. REXER

A metallurgist. Worked with beryllium metal. Was especially active in heat transfer measurements.

Dr. KEPPEL

A chemist. Built a large chemical laboratory. Had one German male colleague, [redacted] also three Russian female colleagues. This group was concerned with chemical analysis of beryllium metal for traces of impurities. They worked closely with:-

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Dr. WESTMAYER

A spectroscopist in charge of a spectroscopy laboratory. At the beginning concentrated on spectrographic methods and later turned his attention to analysis of photographs of "neutron traces" from a neutron source.

Dr. RIEWE

Also worked on spectroscopy in special laboratory constructed for him. [redacted]

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Dr. BUSSE

Worked on a project for building a linear particle acceleration.

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von. OERTZEN

[redacted] worked with BUSSE

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(b) Russian

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Prof. I. BLOCHINTSEV

Head of theoretical physics laboratory with three scientific colleagues.

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BLOCHINTSEV was, of course, the author of a well-known Russian treatise on theoretical physics.

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Dr. NEMEROVSKI

Worked with the above on practical aspect of some of the problems discussed.

LEIPUNSKI

Occupied at first an influential position in the institute

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KRASSIN

Physicist. Worked closely with theoretical group on diffusion and cross section problems.

PART IV - ANNEXURES

Annexure "A"

Annexure "B"

Annexure "C"

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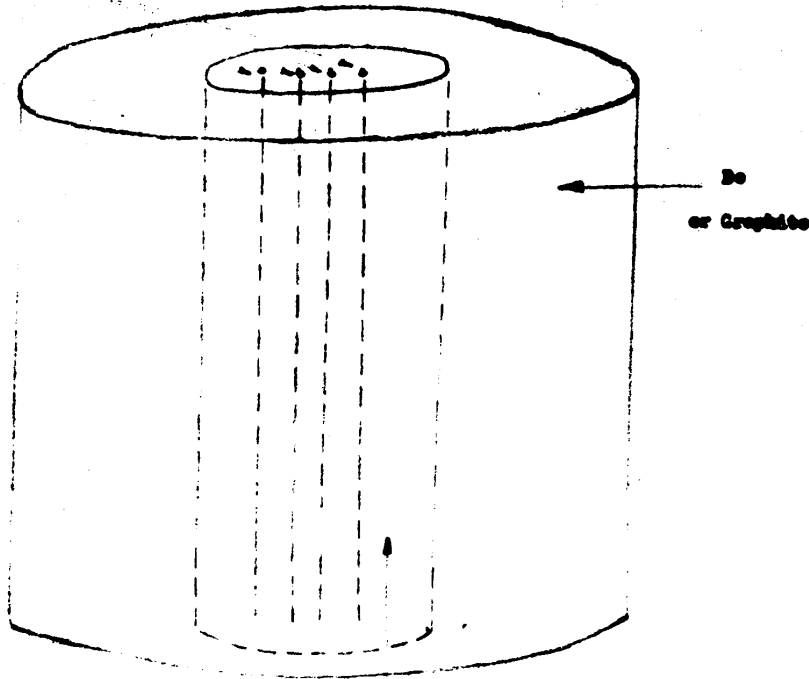
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Atomic War

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Sketch (diagrammatic) of Reactor Model.

Rods 8-10 cm. spacing
2m in length and
0.5 - 1 cm. in diameter



Be
or BeO

No details of dimensions of model
available from Informant

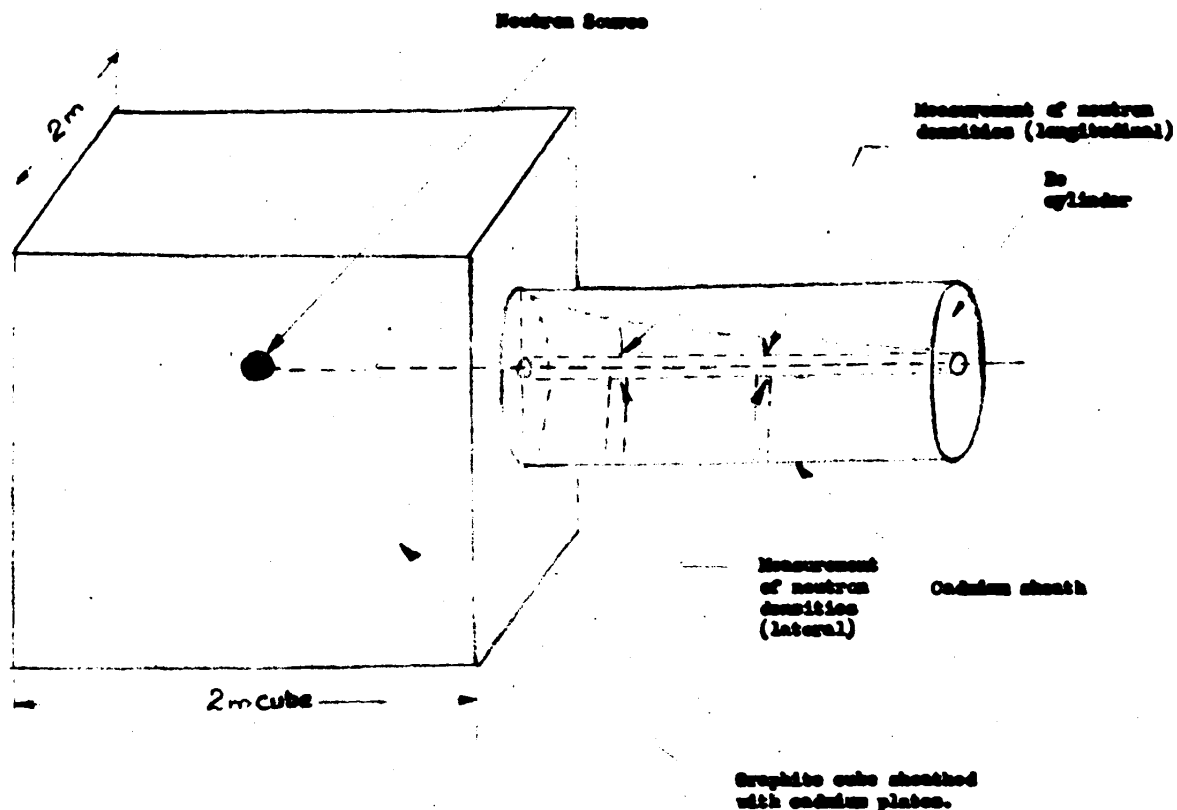
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Neutron densities were measured in both directions in the beryllium cylinder as shown. Method of observation by means of a 'bare counter' moved in longitudinal and lateral channels. It was required to compute the cross section of the beryllium.

Dimensions of graphite blocks - 30 x 30 x 65 cm.

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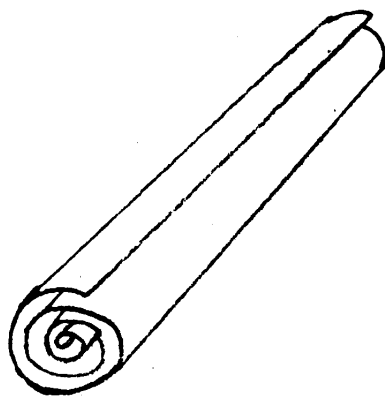
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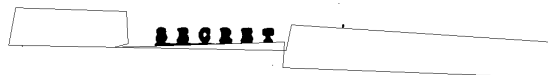
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Coiled Uranium sheet for use as 'rod' in High Temperature heterogeneous
reactor operating at 800°K using Bismuth metal as coolant.

This circulated through the channels within the coil. Dimensions
unknown to informant.

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(iii) Evaluation of Information

The brief account of the work in the POSE Institute, together with

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Russian personalities and activities there throw rather more light on the purpose of the POSE Institute

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it now transpires that the Institute was primarily concerned with questions arising from reactor theory and possibly to some extent even design. It is considered to be of some interest, in view of the nature of the tasks, that here in accordance with the usual 1037.P and "DRAGON" pattern the Germans found themselves as usual working on somewhat parallel lines to Russians engaged on similar if rather more comprehensive work.

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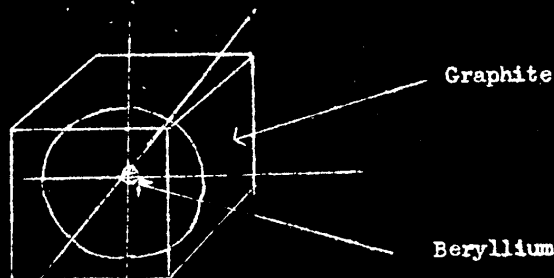
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using the formula - [REDACTED]

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The problem centred itself around the characteristics of a sphere of beryllium embedded in graphite subjected to neutron bombardment.



The proposal came up in July, 1950 after KRASSIN had measured absorption cross section by the above-mentioned roundabout diffusion methods, to try more direct measurement. This was furthered by BLOCHINTSEV [REDACTED]

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von OERTZEN

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(b) Russian

Prof. I. BLOCHINTSEV

Head of theoretical physics laboratory with three scientific colleagues.

BLOCHINTSEV was, of course, the author of a well-known Russian treatise on theoretical physics.

Dr. NEMEROVSKI

worked with the above on practical aspect of some of the problems discussed.

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Occupied at first an influential position in the institute

KRASSIN

Physicist. worked closely with theoretical group on diffusion and cross section problems.

PART IV - ANNEXURES

Annexure "A"

Annexure "B"

Annexure "C"

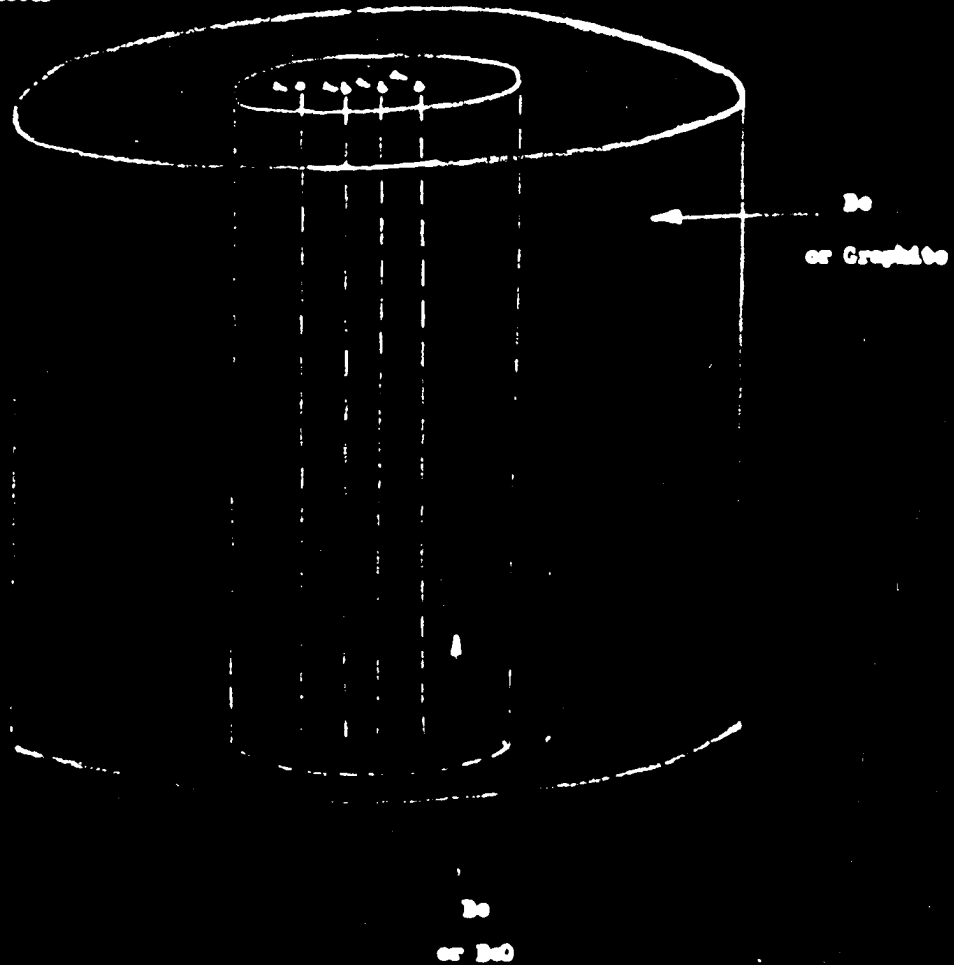
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Sketch (diagrammatic) of Reactor Model.

Rods 3-10 cm. spacing
2m in length and
0.5 - 1 cm. in diameter

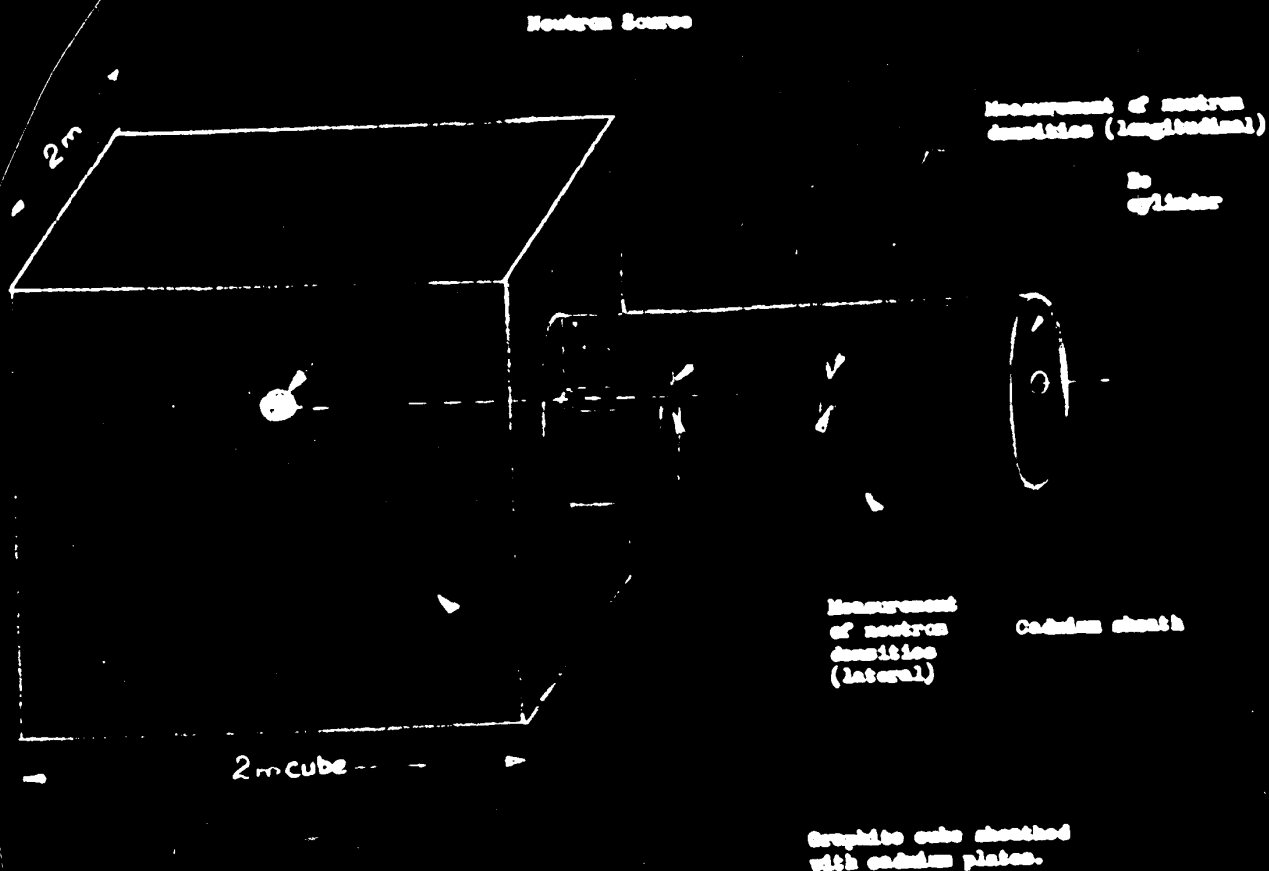


No details of dimensions of model
available from Informant

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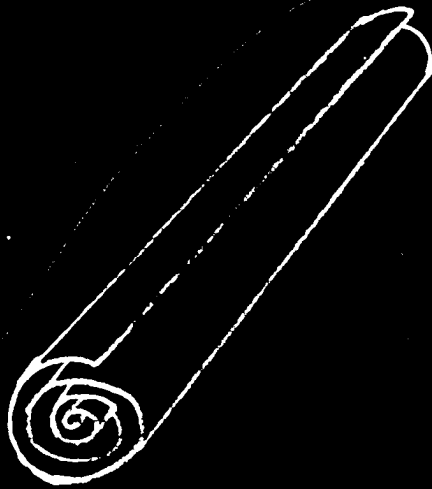
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Dimensions of graphite blocks - $30 \times 30 \times 65$ cm.

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Coiled Uranium sheet for use as 'rod' in High Temperature heterogeneous
reactor operating at 800°K using Bismuth metal as coolant.
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